Sheet 4 : Network

1

[13] Consider a router that interconnects three subnets(1, 2, 3) suppose all of interfaces in each of these three subnets are required to have the prefix 223.1.17.0/24. Also suppose that subnet 1 is required to support at least 60 interfaces. subnet 2 is to support at least 90 interfaces & subnet 3 → 12 interfaces

Provide three network addresses (of form of a.b.c.d/x) that satisfy these constraints.

① 90 Host

② 60 Host 223.1.17.0/24

③ 12 Host

→ for subnet 1 (90 Host)

$2^h - 2 \geq 90 \Rightarrow h = 7$ (so 1 bit for network) + 24 = 25

Net ID : 223.1.17.0/25

→ for subnet 2 (60 Host)

$2^h - 2 \geq 60 \Rightarrow h = 6$ (2 bit for network

Net. ID : 223.1.17.0/26

→ for subnet 3 (12 Host) ⇒ h = 4 (4 bit for network)

Net. ID : 223.1.17.0/28

16 Consider a subnet with Prefix (128.119.40.128/26) Give an example of one IP address (of form xxx.xxx.xxx.xxx) that can be ~~designed~~ assigned to the network. suppose that an ISP owns the block of addresses of the form (128.119.40.64/26) suppose it wants to create for subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets?

→ any address from 128.119.40.129 ⇒ 128.119.40.191

↳ because (/26) tells us we use 6 bit for users so we have 64 Host but we leave .128 for net. ID .192 for broadcast.

Prefix: 128.119.40.64/26 (we wanna divide it into 4 networks having the same size)

128.119.40.64/26
128.119.40.80/26
128.119.40.96/26
128.119.40.112/26

لأنه (/26) تعني استخدمنا (6bit) للـ(Network) يعني (64 Host)

So: $\frac{64}{4} = 16$ Host for each network

← لاحظ اللي بيزيد بس هو رقم الـ (Host) بفرق 16.

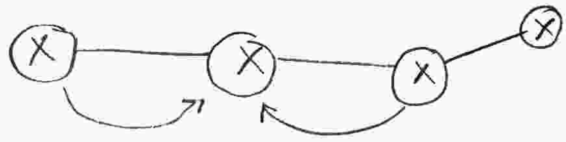
Notes

Link state

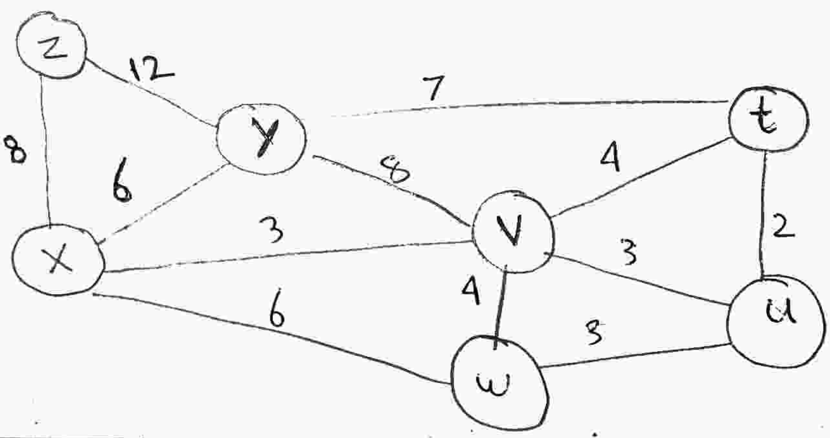
→ Every node Knows about all nodes in the network.

Distant vector

↳ Each node Knows only about its neighbours.



(26) For this network with link costs us Dijkstra's shortest path algorithm to compute shortes path from X to all network nodes. show it in a table.



step	N'	D(y)	d(w)	d(v)	d(u)	d(t)	d(z)
0	x	6, x	6, x	3, x	∞	∞	∞
1	xv	6, x	6, x				
2	xvy		6, x		6, v	7, v	8, x
3	xvyw				6, v	7, v	8, x
4	xvywu				6, v	7, v	8, x
5	xvywut					7, v	8, x
6	xvywutz						8, x

27 a) repeat 26 starting with node t.

step	N'	D(y)	~~D(w)~~ D(v)	D(u)	D(w)	D(x)	D(z)
0	t	7, t	4, t	2, t	∞	∞	∞
1	tu	7, t	4, t		5, u	∞	∞
2	tuv	7, t			5, u	7, v	∞
3	tuvw	7, t				7, V	∞
4	tuvwy					7, V	19, y
5	tuvwyx						15, x ~~19, y~~
6	tuvwyxz						

b) repeat 26 starting with node u

c) ″ ″ ″ ″ ″ v

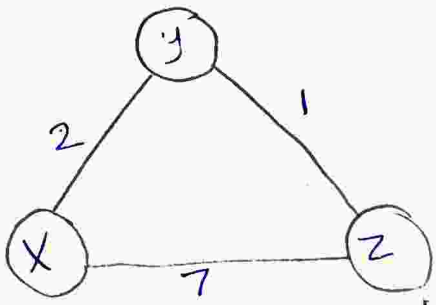
d) ″ ″ ″ ″ ″ w

e) ″ ″ ″ ″ ″ y

f) ″ ″ ″ ″ ″ z

* using distance vector show distance table.

not in sheet



$\boxed{X}$

	x	y	z
x	0	2	7
y	∞	∞	∞
z	∞	∞	∞

	x	y	z
x	0	2	3 ~~7~~
y	2	0	1
z	7	1	0

	x	y	z
x	0	2	3
y	2	0	1
z	3	1	0

$\boxed{Y}$

	x	y	z
x	∞	∞	∞
y	2	0	1
z	∞	∞	∞

	x	y	z
x	0	2	7
y	2	0	1
z	7	1	0

	x	y	z
x	0	2	3
y	2	0	1
z	3	1	0

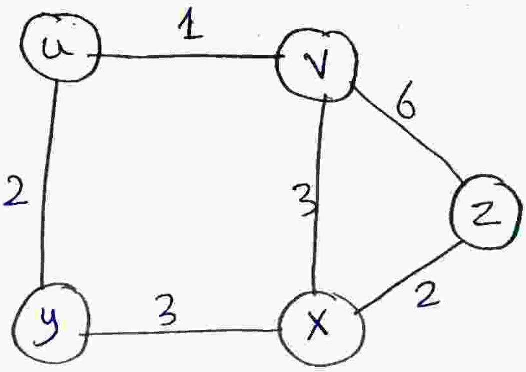
$\boxed{Z}$

	x	y	z
x	∞	∞	∞
y	∞	∞	∞
z	7	1	0

	x	y	z
x	0	2	7
y	2	0	1
z	~~7~~ 3	1	0

	x	y	z
x	0	2	3
y	2	0	1
z	3	1	0

28 Consider this network, assume each node initially knows the costs to each of its neighbors. Consider distance algorithm and show distance table entries at node Z.



Z

	u	v	x	y	z
x	∞	∞	∞	∞	∞
v	∞	∞	∞	∞	∞
z	∞	6	2	∞	0

V

	u	v	x	y	z
x	∞	∞	∞	∞	∞
u	∞	∞	∞	∞	∞
z	∞	∞	∞	∞	∞
v	1	0	3	∞	6

X

	u	v	x	y	z
y	∞	∞	∞	∞	∞
v	∞	∞	∞	∞	∞
z	∞	∞	∞	∞	∞
x	∞	3	0	3	2

	u	v	x	y	z
x	∞	3	0	3	2
v	1	0	3	∞	6
z	7	5	2	5	0

	u	v	x	y	z
x	∞	3	0	3	2
u	0	1	∞	2	∞
z	∞	6	2	∞	0
v	1	0	3	3	5

	u	v	x	y	z
y	2	∞	3	0	∞
v	1	0	3	∞	6
z	∞	6	2	∞	0
x	4	3	0	3	2

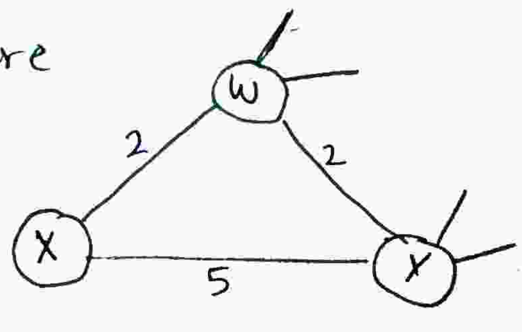
Z

	u	v	x	y	z
x	4	3	0	3	2
v	1	0	3	3	5
z	6	5	2	5	0

$\boxed{29}$ Consider a general topology (that is, not the specific network shown above) and a synchronous version of distance vector algorithm, suppose that at each iteration, a node exchanges its distance vectors with its neighbors and receives their distance vector. Assuming that the algorithm begins with each node knowing only the costs to its immediate neighbors, what is the maximum number of iterations required before the distributed algorithm converges? Justify your answer?

n-1 / n → is the number of the nodes in the tallest path without loops.

$\boxed{30}$ Consider the network fragment shown below. ~~Complete~~ x has only two attached neighbors w & y. w has minimum-cost path to dst. u (not shown) of 5, and y has minimum-cost path to dst. u of 6. Complete paths from w and y to u are not shown.



a) Give x's distance vector for destinations w, y, u

$D_x(w) = 2$, $D_x(u) = 7$ through w

$D_x(y) = \min\{c(x,y) + D_y(y), c(x,w) + D_w(y)\} = 4$

b) Give a link-cost change for either c(x, w) or c(x, y) such that x will inform its neighbors of a new minimum-cost path to u as a result of executing distance vector algorithm.

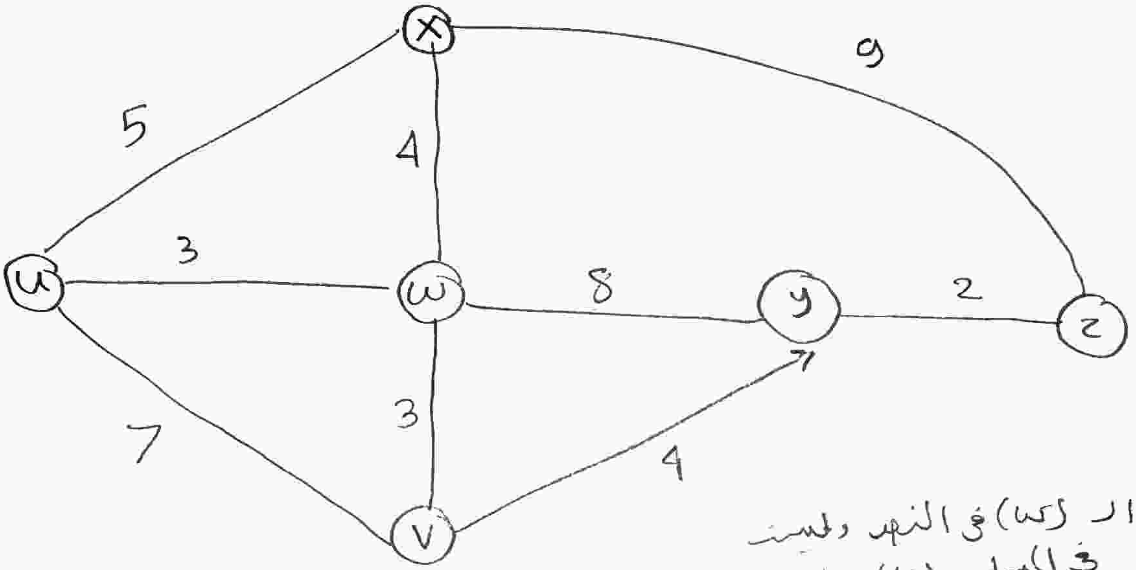
let $c(x,u) \geq 7$

c) Give a link-cost change for either c(x, w) or c(x, y) such that x will not informs its neighbors . . . . . .

Let c(x, y) be any thing.

routing table link state

not in sheet



ال (كست) في النهاية وليست في المسار (u)

step	d(x)	d(w)	d(v)	d(y)	d(z)
u	5,u	3,u	7,u	∞	∞
uw	~~7,w~~		6,w	11,w	∞
	5,u		~~7,w~~	~~12,w~~ ~~11,w~~	14, x
uwx			6,w	11,w	
uwxv				11,v	~~∞~~ 14, x
uwxvy					13,y
uwxvyz					